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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/035,400	10/26/2001	Koji Yoshida	P/1071-1505	3376

7590 03/21/2005
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EXAMINER	
RUGGLES, JOHN S	
ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 03/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/035,400

Applicant(s)

YOSHIDA ET AL.

Examiner

John Ruggles

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claims 1-3 have been currently amended and remain under consideration.

Drawings

The previous drawings objections have been overcome by current amendments.

Claim Rejections - 35 USC § 112

The previous rejection under the first paragraph of 35 U.S.C. 112 has been overcome by current amendments.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brebels et al. (US Patent 5,675,295) in view of Hwang et al. (US Patent 5,837,427), further in view of Kornrumpf et al. (US Patent 5,355,102), further in view of Carey et al. (US Patent 5,219,787), further in view of Ohya et al. (US Patent 5,686,172), and further in view of at least one of: Trinh et al. (US Patent 5,132,648), Peterson (US Patent 5,574,415), and/or Kroger (US Patent 4,490,733).

Brebels teaches a microwave or millimeter wave (milli-wave) oscillator device (interpreted as a module) usable in a receiver, transmitter, transceiver, or other electronic component (multichip module, MCM, column 2 line 32, column 22 line 37, and column 23 lines 44-45) and a method of manufacturing the device or module (column 1 lines 7-11). The transceiver (also interpreted as a module) is designed for compactness (including a thin film circuit board having a pattern area of 5 cm^2 or less) and robustness (column 4 lines 35-37). The method includes forming a first metal (conductor film) on a substrate in a predetermined pattern by lift-off technology (column 8 lines 11-12). Lift-off technology is understood to mean that a resist is patterned on the substrate, the metal conductor film is formed over the patterned resist and substrate, followed by removal of the resist along with overlying portions of metal conductor to form the patterned metal conductor film. Column 8 lines 20-35 describe forming and patterning a photosensitive or non-photosensitive organic insulation layer (film of, e.g., polyimide, photosensitive benzocyclobutene (column 19 lines 25-34, e.g., photo-BCB), etc.) up to 10-20 microns (μm) thick to cover the metal conductor film. TiW/Au/TiW and Au are used as metal conductor film materials (column 8 lines 49-59). According to column 19 lines 22-44, thin film technology may be used to form an antenna; multiple layers of low dielectric loss (insulation layer) materials are built up (e.g., spun on, etc. – photo-BCB having a thickness in the range of $1\text{-}50\mu\text{m}$) to form an insulating film; and metal (e.g., Ti/Cu/Ti, etc.) layers are deposited (formed, e.g., by vaporization, etc.) on the substrate and patterned by conventional methods. Portions of a low dielectric constant (non-photosensitive organic insulating film) not covered by a patterned patch or feed line (not masked) are removed by dry etching (column 19 lines 66-67, instant claim 3). If photosensitive, the low dielectric constant material is spun (formed) $20\mu\text{m}$

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thick onto a substrate (of high dielectric material having a metal conductor film formed thereon), baked by a hot plate, exposed to a pattern, developed, and baked (column 20 lines 1-6). Note that by applicant's own admission on instant page 5, polyimide and benzocyclobutene inherently have stresses in the range of 15-60 MPa. Therefore, Brebels inherently teaches an insulating film stress in this range (as recited in instant claim 1) by teaching the use of these insulating film materials (e.g., polyimide, benzocyclobutene, etc.).

While teaching the other limitations of instant claims 1-3 as discussed above, Brebels does not specifically teach: *[1]* curing and patterning of the insulating film; *[2]* building up separately developed and cured insulating films; *[3]* cleaning a ceramic substrate (as the high dielectric substrate) having a thickness of 0.05-2 mm and a flexural strength of 500-4000 kgf/cm² before coating; and *[4]* alternatively forming the conductor film from at least one of Ag, Ni, Cr, Al, Nb, and/or V.

However, curing and patterning of separately built-up insulating films has been known for some time in the art of multilayer circuit manufacturing for a multichip module (MCM), as exemplified by Hwang. Hwang teaches a method of manufacturing a multilayer circuit for a multichip module (MCM, abstract) that includes patterning a Cu circuit on an insulating substrate, and then separately forming plural patterned insulating resin layers having a thickness of 17-115μm over the Cu circuit (column 3 lines 18-47). Specific examples of thickness for each of the separate first and second insulating layers are 25μm, 30μm, or 35μm (column 6 lines 45-46 and column 7 lines 3-6, which read on the 20μm or greater thickness insulating film of instant claim 1). The first insulating resin layer 114 is patterned by coating, pre-curing through pre-drying (heating or baking, column 5 lines 5-8), exposing through a patterned mask, and

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developing (as shown in Figure 2C, column 3 lines 51-67). Similarly, the second insulating resin layer 116 is patterned by coating over the first patterned insulating layer 114, pre-curing through pre-drying (heating or baking), exposing through a patterned mask, and developing (as shown in Figures 2D-2E, column 4 lines 1-34). Both first and second developed insulating resin layer patterns 114 and 116 are then subjected to final drying by heating and curing (column 6 lines 5-7 and column 7 lines 13-16, which reads on the repeated insulating film curing and patterning steps of instant claims 1 and 2). This method allows easy adjustment of each separate individual insulator pattern in the built-up multilayer insulating resin profile for high reliability and high density in a multilayer circuit for an MCM (column 2 lines 11-12 and column 11 lines 26-28).

Kornrumpf shows a microwave thin film circuit having a ceramic (e.g., alumina, etc.) substrate, which is 25-100 mils (0.635-2.54 mm) thick and reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. The 12.5-75 μ m thick polyimide insulating film reads on the 20 μ m or greater thickness insulating film of instant claim 1. A conductor film is patterned either (1) while being deposited or (2) first deposited as a continuous layer and then patterned by etching through a patterned resist layer (column 1, lines 28-60 and column 4, lines 6-43). Additional dielectric layers of polyimide or polyimide epoxy blend are formed over the earlier polyimide insulating film (column 10, lines 14-20 and column 11, lines 56-50). The microwave thin film circuit made by this method has a high density interconnect structure formed in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits (abstract).

Carey describes a process of trenching to form channels, vias, and components in a substrate, including a thin film circuit board or a high density multichip module (understood to

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include a waveguide, column 1, lines 50-59). The process includes cleaning an alumina ceramic substrate before coating with a polyimide insulating layer to assure acceptable contamination removal and coating adhesion (column 2, line 58 to column 3, line 4).

Ohya discloses a process of making a metal-foil-clad composite ceramic board (interpreted as a thin film circuit board) having greatly improved flexural strength applicable to a variety of fields where the excellent properties (e.g., physical, dielectric, etc.) of ceramic are essential (column 1, lines 1-28). The process of making the ceramic board includes curing the resin in a 0.1-6 mm thick resin-impregnated sintered ceramic substrate (column 5, lines 29-30), which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1. Preferably, the flexural strength is at least 40-50 MPa ($408\text{-}510\text{ kgf/cm}^2$ or greater), because a 1 mm thick substrate having a flexural strength less than 40 MPa (408 kgf/cm^2) would be fragile, in which cracking is liable to occur during handling or processing (column 5, lines 56-60 and column 11, lines 3-15). This encompasses the flexural strength range of $500\text{-}4000\text{ kgf/cm}^2$ recited in instant claim 1. Specific examples of flexural strength for the composite ceramic substrate ranging from 46-181 MPa ($469\text{-}1846\text{ kgf/cm}^2$) are shown in Tables 1, 6-1, and 6-2 found in columns 33 and 41. The metal for the foil is selected from copper (Cu), aluminum (Al), nickel (Ni), or various combinations of these metals (column 20, lines 42-49, for Ni, Al, or combinations thereof (understood to include alloys thereof) in instant claim 1).

Trinh teaches a monolithic microwave integrated circuit (MMIC, used as a microwave module for radio frequency communication) made with a circuit of highly conductive material (e.g., Ag, etc.) patterned on an insulating ceramic (e.g., alumina, etc.). This microwave

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integrated circuit has increased thermal stability and reduced mechanical stress (column 3, lines 5-55).

Peterson shows a multilayer microwave structure (understood to be a circuit) made by building up sequentially patterned metal (e.g., Cu, Cr, Al, etc.) and insulating layers of epoxy or polyimide using standard resist patterning with or without lift-off (abstract and column 4, lines 36-57).

Kroger describes millimeter wave and microwave detectors and mixers (again, understood to be circuits) having patterned conductor electrode layers made with superconducting metal alloy of a refractory metal (e.g., Nb, V, etc.) coated on insulating layers (column 4, lines 52-54, column 6, lines 36-37, and column 9, lines 33-40).

It would have been obvious to one of ordinary skill in the art at the time of the invention to carry out the photolithographic process of making a microwave or milli-wave module (MCM or circuit) as taught by Brebels to specifically include repeated insulating film curing and patterning steps to allow easy adjustment of each separate individual insulator pattern in the built-up multilayer insulator resin profile for high reliability and high density in a multilayer circuit for an MCM, as taught by Hwang [1], [2]. It would also have been obvious in the method of Brebels and Hwang to use a ceramic (e.g., alumina, etc.) substrate 25-100 mils (0.635-2.54 mm) thick (which reads on the 0.05-2 mm thick ceramic substrate of instant claim 1) as shown by Kornrumpf in order to form a high density interconnect structure in a manner that provides close impedance matching, minimizes impedance discontinuities, and substantially increases the yield of good circuits; and in which this ceramic substrate also has a flexural strength of at least 408 kgf/cm² to avoid cracking of the substrate or circuit during handling or processing as

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disclosed by Ohya (encompassing the flexural strength range of 500-4000 kgf/cm² recited in instant claim 1). In addition, it would have been obvious to clean the alumina (dielectric) ceramic substrate before coating with a polyimide insulating film to assure acceptable contamination removal and adhesion of the coating, as described by Carey [3].

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture the microwave circuit as taught by Brebels (Cu, Au, or Ti), Hwang (Cu), Kornrumpf, Carey, and Ohya (Cu, Ni, Ni alloy (reading on Ni-Cr), or Al) using a conductor film made from at least one metal selected either from those already listed or alternatively from the following: Ag (taught by Trinh), Cr (shown by Peterson), Nb, and/or V (described by Kroger). This is because Brebels, Hwang, Kornrumpf, Carey, Ohya, Trinh, Peterson, and Kroger all relate to the same art of circuit manufacture. This combination encompasses instant claim 1 for a conductor film including at least one selected from Cu, Au, Ag, Ni, Cr, Al, Ti, Ni-Cr, Nb, and/or V [4].

Response to Arguments

The previous drawings objections have been overcome by current amendments, as stated above.

The previous rejection under the first paragraph of 35 U.S.C. 112 has also been overcome by current amendments, as stated above.

Applicants' arguments with respect to claims 1-3 have been considered but are moot in view of the new ground(s) of rejection, as necessitated by amendment and set forth above.

In response to Applicants' argument on page 7 of 9 that different ceramic substrates were proposed in the rejection, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, it was never intended that different ceramic substrates be applied in a double substitution arrangement as now being argued for the first time by Applicants, but rather that the singular substitution ceramic substrate should possess both the thickness taught by Kornrumpf and the flexural strength disclosed by Ohya (for the previously stated reasons, which are again set forth above).

In response to Applicants' argument on page 8 of 9 that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). The reasons for combining the references have been derived from the references themselves and from the knowledge readily available to one of ordinary skill in the art, as previously stated throughout prosecution and now revised to incorporate changes necessitated by amendment. This does not amount to improper hindsight as alleged by Applicants.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

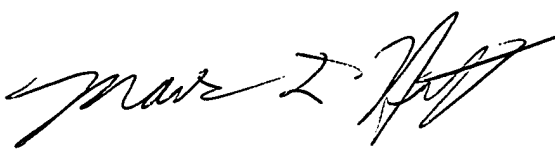
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

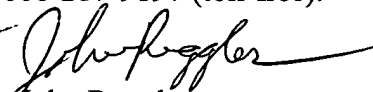
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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